in which he holds that we cannot compare an embryonic characteristic with an *adult* ancestral one, but that embryonic characters only can be compared. "Their resemblances are explained on the assumption that there has been an ancestral adult form having these embryonic stages in its development, and these stages have been handed down to the divergent lines of its descendants."

The wide scope of the work may be indicated best by an enumeration of the titles of the different chapters. There is a chapter on the problem of adaptation, two on the theory of evolution, three are devoted to a criticism of the theories of natural selection and sexual selection, then come successively, the inheritance of acquired characters, continuous and discontinuous variation and heredity, evolution as the result of external and internal factors, the origin of the different kinds of adaptations, tropisms and instincts as adaptations, sex as an adaptation, and finally a summary with general conclusions.

The book is a valuable one both for its clear statement of the problems under discussion and for its many new ideas. It will undoubtedly be read by a wide circle of biologists and others interested in questions of evolution and adaptation.—CHARLES ZELENY.

The cell of the Cyanophyceae.

IN REGARD to the structure of the cell of the Cyanophyceae, observations, interpretations, and theories have long been conflicting and often contradictory, some observers describing a nucleus and chromatophores, and others denying the existence of such structures, while only less difference of opinion has been manifested in regard to other cell contents, the membranes, gelatinous envelopes, and the heterocysts. Kohl has just published a book[2] in which he first gives a critical discussion of previous literature, paying particular attention to the work of Bütschli, Hegler, Palla, Fischer, Zacharias, and Brand. He then describes his own work in great detail, with full illustrations on ten colored lithograph plates. Tolypothrix, Nostoc, and Anabaena are the principal forms studied and nearly all of the figures are from *Tolypothrix lanata* and *Nostoc coeruleum*.

The following topics are treated: central granules, cyanophycin granules, oil, chromatophores, glycogen, membrane and partitions, protoplasmic connections, "Verschlusskörper," vacuoles, chromatic substance, heterocysts, concave cells, central body; with some remarks on the relationship between the Cyanophyceae and bacteria. There is also a valuable table containing the most important tests and staining reactions. Without attempting to separate original views from confirmations and contradictions, the author's results, as gathered from the summary and body of the work, are about as

[2] KOHL, F. G., Ueber die Organization und die Physiologie der Cyanophyceenzelle und die mitotische Teilung ihres Kernes. 8vo. pp. 240. *pls.* 10. Gustav Fischer, Jena, 1903. *M* 20.

follows. The protoplast of the Cyanophyceae does not differ essentially from that of other plant cells, having a nucleus and peripheral cytoplasm with chromatophores. There is always a single nucleus, organized as an independent organ and consisting of a relatively faintly staining ground mass in which the chromatin is imbedded and a larger or smaller number of "central granules" which are not found outside the nucleus. The nucleus differs from that of the higher plants (1) in the absence of a nuclear membrane,[3] (2) in the absence of nucleoli, and (3) in its form. The cytoplasm contains chromatophores, oil drops, cyanophycin granules, glycogen, and vacuoles. The chromatophores contain chlorophyll, carotin, and phycocyanin. The product of assimilation is glycogen, starch not being demonstrable, and the cyanophycin granules represent reserved albumen. The membranes of the vegetative cells are not cuticularized but consist principally of chitin, while those of the heterocyst are mostly cellulose. There are innumerable small chromatophores. The oft discussed central body is a genuine nucleus. During mitosis a spirem is formed which breaks up into chromosomes, and the various phases bear so striking a resemblance to those of higher plants that the author does not hesitate to designate them as *spirem*, *equatorial plate*, *diaster*, and *dispirem*. Threads resembling a spindle are shown in several figures. Protoplasmic connections between vegetative cells have been demonstrated in many cases. Chromatin is said to be a constant constituent of the cells of the bacteria as well of those of the Cyanophyceae, and Kohl believes that the two groups are very intimately related.—C. J. CHAMBERLAIN.

Handbook of systematic botany.

THE SECOND PART of Wettstein's handbook,[4] which has just appeared, deals with bryophytes, pteridophytes, and gymnosperms; the remaining section, which is to treat of angiosperms, will contain the index and will complete the work. The author proposes a complete system of classification, the main features of which were given in the review of the first part.[5] The taxonomic characters of the larger groups, of families, and sometimes of the most important genera, are given and the classification determines the order of treatment. However, the book is of equal interest to the morphologist, for development and embryology are carefully treated and are constantly used to support the author's views of relationships. The illustrations representing the development of organs from the standpoint of comparative morphology are particularly instructive, as is also the plate illustrating the evolution of plants, from the algae to the angiosperms. Considering the able

[3] No reference is made to the work of Lawson, who, in the BOTANICAL GAZETTE for May 1903, discussed the absence of the nuclear membrane in the Cyanophyceae.

[4] WETTSTEIN, R. v., Handbuch der systematischen Botanik. II. Band, Theil I. 8vo. pp. 160. 1 colored plate, figs. 100. Leipzig and Wien: Franz Deuticke. 1903. *M* 4.

[5] BOT. GAZ. **32**: 61–62. 1901.